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and almost every kind of opinion, conversation, tastes, fashions, follies, vices. Till we think a little of the subject, we shall have no conception of the minuteness and extent of information which these papers give us. It seems as if nothing were left untold; not because we have looked for every thing and found it, but because nothing is felt to be wanting. London is all about us. We do not take it in at once, or, like strangers and travellers, go over the whole, as a business; but we become acquainted with it as we do with our own town and neighbours, in the course of our business and amusements. Such is the charm and power of these sketches of real life, drawn incidentally in the course of moral instruction, and not prepared for the purpose of giving lively and complete representations.

ART. III. — *Resumo de Observações Geologicas feitas em uma Viagem a 's Ilhas da Madeira, Porto Santo, e Açores, nos Annos de* 1835 *e* 1836, pelo Conde VARGAS DE BEDEMAR, Camarista de El-Rei de Dinamarca, Director do Museo Real da Historia Natural, e Socio da Academia Real das Sciencias em Compenhagen. Lisboa; Galhardo Irmãos. 1837. 12mo. pp. 14.

Summary of Geological Observations made in a Voyage to the Islands of Madeira, Porto Santo, and Azores, in the Years 1835 *and* 1836, by Count VARGAS DE BEDEMAR.

THE student of Geology finds nothing in his popular and fascinating department of science, that has stronger claims upon his attention, or is calculated to awaken more ardent curiosity, than the phenomena exhibited by volcanoes in action, or by tracts of country, which have, as it were, been created by those whose energies have long since been exhausted. The volcanic or non volcanic origin of the rocks and strata of countries, which, to common observers, present no indications of the manner in which they have been formed, has been one of the most fruitful topics of discussion and of keen controversy among the geologists of Europe. Long and perilous journeys have been undertaken, and expensive and wearisome voyages performed, to settle the question in regard to some particular stratum or mountain, or to support a favorite theory; and every new work on volcanic regions is still looked for by the geologist with undiminished interest. The more we learn of volcanic formations, the more are we led to attribute to volcanic agency, during every geological period, and to look upon it as affording the most satisfactory explanation of the elevation of mountain chains, the inclination, depression, fractures, and dislocations of strata; in short, as having greatly modified the aspect of the whole surface of the earth.

To the class of undoubted extinct volcanoes must be referred by far the greater part, if not all, those serrated, conical, or truncated summits which rise above the waters of the Atlantic and Pacific oceans; and there are but few of them more interesting than those midway between the old and new continents, which the work named at the head of this article professes to describe. Before proceeding to the account given by Count Vargas of the geological structure of Madeira and the other islands, we propose to mention some points in their natural history and appearance, not alluded to in his work.

Madeira belongs, as do the other islands described in the "Resumo," to the Portuguese, and is situated in 17° of west longitude, and 32° 30′ of north latitude, off the western coast of Africa. It rises for the most part abruptly from the Atlantic, and its highest summit exceeds six thousand feet.* Its picturesque and beautiful appearance has been often described. The air is loaded with perfumes, the large leaves of the banana wave over the walls, and the splendid palm trees overtop the houses. The coffee trees form hedges and copses, and the mimosas, protea, and a variety of the most gorgeous and fragrant plants, of which we see mere fragments in our hot-houses, here rise, says Von Buch, "to tall and stately trees, displaying their far glittering blossoms in the most delightful climate upon earth." Madeira is liberally supplied with rivulets and cascades, that leap from rock to rock, through bushes of rosemary, jessamine, laurel, and myrtle. Groves of chestnut and pine trees stretch out along the declivities of the mountains, and the air is filled with the warblings of thousands of canary birds from their branches.

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* Bowdich, in the Edinburgh Philosophical Journal, No. IX.

"Named from her woods, with fragrant bowers adorned,
From fair Madeira's purple coast we turned. —
A shore so flowery, and so sweet an air,
Venus might build her dearest temple there." *

The uniformity of the temperature of Madeira is almost unexampled. The average range of the thermometer, from the observations of an English physician long resident in Funchal, is from 68° to 76° of Fahrenheit during the summer, and from 57° to 65° in winter. The mean temperature deduced by Mr. Bowdich from his observations was 66°. Every desirable variety of temperature can be enjoyed, with the accompanying changes in vegetation, until the continued snow is entered at the height of five thousand one hundred and forty-eight French feet.† At this height the precipices and chasms are numerous, and many of them frightful and inaccessible.

Madeira has long been the resort of invalids, especially of consumptive patients. The most favorable season for them is from November to the middle of June. In July, August, and September, the heat occasionally becomes excessive, and the influence of the Sirocco wind has been known to cause a rise of temperature to 130° of Fahrenheit, a heat sufficient to melt wax. The winters too are sometimes stormy and uncomfortable. The geological structure of the island unfortunately is an insuperable obstacle to the construction of roads, and the invalid is debarred from the salutary exercise of riding.

The other islands which are noticed in this "Resumo" compose a distinct group, and are known as the Azores or Western islands. They are nine in number, and situated to the northwest of Madeira, between 37° and 39° of north latitude, and 25° and 31° of west longitude. The largest and most important is the island of St. Michael's. It is about fifty miles in length, and its breadth varies from six to ten. It rises in many parts precipitously from the water, at others very gradually. Here are seen gently sloping and spreading declivities, and there a long line of elevated ridges, with huge angular buttresses of rock running up from their base, between which, narrow silvery streams of water are often dashing along, or unite to form a picturesque cascade. The more level parts are dotted with hundreds of small hills, many of

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* Mickle's Lusiad, Book V.
† The French foot is equal to 1.066 English.

which are perfect cones, while others are truncated, or terminate in crater-shaped summits. The lower parts of the island are cultivated, and exhibit extended fields of Indian corn, wheat, and the various culinary vegetables. Houses and villages are scattered all along the coast, intermixed with vineyards and orange gardens. The population is about eighty thousand.

Next in importance is the island of Fayal, which is of much smaller size, being but about fifty miles in circumference. It rises more abruptly from the water, but is not inferior in point of beauty. A voyage (it can hardly be so called) of twelve or fourteen days transports us, as by a magician's spell, from the piercing blasts of our New England spring, to the bland and delicious temperature of these islands. Snow and ice are scarcely lost sight of, before the islanders are alongside in their little boats laden with baskets of luscious figs and tempting oranges, somewhat promiscuously mingled with fish of brilliant hues, shaded from the sun by the fragrant roses and geraniums just plucked from their luxuriant bushes. One who has not experienced the change can have but a faint conception of the reality, or of the new existence upon which he seems to have entered, while coasting along, under a cloudless sky and with our most delightful June temperature, towards the anchorage of Horta, the principal city of Fayal. On the right are the bold shores of the island, crowned with a rich vegetation, and divided into a multitude of small enclosures, as regular as the squares upon a chess-board, by verdant hedges overrun with flowering vines, and coming down to the very edge of the precipices, while here and there the white tower of a church or chapel peeps out from among the trees, and the eye rests from time to time upon the cottages, singly, or in clusters, that glitter through the peculiarly green foliage. Some appear hanging over the very edge of the cliffs, and others are half concealed in the deep glens and fissures with which the coast is indented. The peasants in their picturesque costumes look down with wonder upon

> "the tall anchoring bark
> Diminished to her cock; the murmuring surge
> That on the unnumbered idle pebbles chafes,
> Can scarce be heard so high."

As we advance, the towering summit of Pico rises among the clouds on the left, a sharp, perfectly defined cone, its apex rarely free from ever-varying masses of vapor, above a stratum of which it is however occasionally seen in bold relief against the clear blue sky. Hours can be passed in watching the changing forms and varying densities of the light clouds that so often crown "the peak." At one time, they are to be seen slowly and majestically rolling up and over one another from the base to the summit,* now and then opening and unveiling it, but soon uniting and shutting it out from view; then, perhaps, breaking up and floating away in feathery festoons, again descending and enveloping its huge mass, or resting upon its sides until wafted away by the passing breeze. Similar changes and atmospheric phenomena are observable over the high lands of all these islands; and so sudden are they, that a proposed excursion to an elevated point is not unfrequently to be abandoned, from the obscurity with which it becomes unexpectedly covered.

The capital of Fayal, Horta, is beautifully situated at the bottom of a semicircular bay, and at the foot of a grand amphitheatre of mountains. The mountains are clothed to their very summits with the myrtle and laurel, and a great variety of flowering shrubs. Gardens and orange groves, so thickly overgrown that scarce a sunbeam gains admission, are numerous, amid which are scattered the country seats, and occasionally a church or a convent. Some of these are very conspicuous and ornamental, from the elevated spots on which they have been erected, overlooking the city and anchorage. Pico is separated from Fayal only by a narrow channel, and rises immediately in front of the city; there are many houses upon it along the water's edge, and behind them are the vineyards, extending a considerable way up its acclivity, † out of which its blackened, burnt, scorified, and seamed mass towers aloft in imposing grandeur.

The city of Horta has an antique appearance, and its streets, compared even to those of Ponta Delgada, the capital of St. Michael's, appear desolate and dreary. They are generally very narrow, wretchedly paved, and not lighted at night. But few persons are seen in them, except in the vicinity of the market-place and custom-house. In Ponta Delgada, on the contrary, the streets are thronged with people, vehicles, and donkeys. The large and once splendid churches and convents in Horta are fast falling to decay, and some are entirely deserted.

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* Estimated at 9000 feet above the sea.

† These vineyards furnish all the wine that is exported under the name of Fayal wine.

The prosperity and growth of all the Azores have suffered as much probably from the want of good harbours, as from any other cause. Immediately on the arrival and anchoring of vessels at Horta, it is found necessary to render them more secure, by sending off in large boats from the shore additional anchors and cables ; but even this is not always a sufficient protection from the fury of the wind and heavy seas, by which they are often driven from their moorings upon the craggy rocks of Pico or Fayal. The best harbour is at St. Michael's, where, although vessels lie at anchor at the distance of half a mile from the city, they have a much better chance of getting to sea, in the event of a gale, than at Fayal. The construction of a safe harbour at St. Michael's could be effected with no very great expense ; for nature has already done much, and had the island belonged to Great Britain or this country, it would long since have been accomplished. The Portuguese government are however said to have the matter under consideration, and some surveys have actually, we believe, been commenced.

The political changes in the mother country have not been without their effect upon the Azores. Very decided and obvious improvement has taken place, especially in St. Michael's. The residence there of Don Pedro, during the contest with Don Miguel, was marked by some vigorous measures. The swarms of friars and nuns were put to flight, their rich territories were taken under the care of the crown, their cells transformed to hospitals and barrack-rooms, and some of their convent chapels converted into monitorial and other schools. One of the chapels is now a reading-room, well supplied with books, periodicals, and newspapers, but supported chiefly by the foreign merchants resident in Ponta Delgada, where two newspapers are moreover published. This is the only island in which an English church has been allowed to be erected, and a resting-place assigned for the repose of the ashes of Protestants, which is a neat enclosure, already exhibiting several handsome monuments, and ornamented with trees and shrubbery. The intercourse with the more enlightened Portuguese who accompanied Don Pedro, and with the increasing numbers of English and American residents, has had a very perceptible influence on the before secluded, thick-blooded "morgardos";* and their children are now often sent to London, Lisbon, or Paris to be educated. Many new buildings have been erected in St. Michael's, some in excellent taste and at enormous cost. New streets have been laid out, and various other improvements commenced. Much of the ceremony that was so great an obstacle to social intercourse, has given way, and females are actually seen in the streets unattended. The introduction of foreign articles of luxury or comfort is now very considerable, many of the shops in Ponta Delgada are well supplied with the fanciful wares of London and Paris, and the fair Portuguese are fast becoming proficients in all the mysteries of "shopping."

The progress of improvement in all these islands is still much impeded by the entail of estates, and the difficulty of purchasing land; but measures are understood to be in train to remove or modify these evils.

We have before alluded to the entire want of good roads in Madeira.† In this respect St. Michael's has the advantage of all its neighbours, the island being traversed in all directions with roads, many of which are suitable for wheel carriages. In Fayal they are little better than wide pathways, up and down steep ascents, roughly paved with large irregular lumps of lava, and deeply cut up by the uncouth wagons, the only wheel carriages that can be used.

With the breaking up of the religious establishments, and the diminution of the influence of the priests, the people have become inattentive to their religious observances. Although the churches are open daily and mass is continued, few worshippers are seen in them. The pic-nic parties, in which the foreign residents so often unite, are accommodated without scruple in the village church, and the repast is allowed to be spread at the foot of the altar. The religious ceremonies and processions are actually ridiculed by those who are required by their office to take part in them.

The changes in the feelings and habits of the people are most observable in the large towns; they have as yet extended but little to the peasantry. One often meets with pretty fair specimens of this class among the drivers of the favorite animal, the donkey. These men travel on foot day after day with little food, always however with a pocket full of parched beans, with which and an occasional glass of sour wine from some village wine shop, indicated by the bush, they are content. Few or none of them taste animal food from one year to another; Indian corn bread, yams, and fish are their staple articles of diet. Even the pig that every cottager rears, goes to pay his rent; and his poultry, if he have any, is demanded by his landlord, or carried to market. Indian corn is so important to them, that its exportation has been often forcibly prevented by the people, until they were supplied at their own price.

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* Proprietors of entailed estates.

† The only mode of travelling is, we believe, in palanquins.

The Azorean peasantry, although miserably poor, are cheerful and industrious. During the summer, night after night they are heard beating the flax on the large stone in front of the door of almost every cottage, until near morning, when a short respite is snatched from toil, to be resumed at the first dawn of light. Yet they are always happy. Their love of music and dancing, in which they are probably not excelled by any people, appears to be to them an unfailing resource. At certain seasons one can hardly pass the door of a cottage, without being arrested by the sounds of the rude guitar or *viola*. During the dance the man sings his extempore effusion of some fifteen or twenty lines, to the accompaniment of the instrument, which is continued by his partner, and by all the others in succession, occasionally enlivened with a melodious snap of the fingers. On the entrance of a stranger he is immediately welcomed in a stanza, and alluded to by each dancer in turn.

But our business is with the work of Count Vargas de Bedemar, upon the Geology of these islands. It is announced as only the *avant courier* of a more copious treatise on the same subject. The large balloon, it is to be hoped, will be better filled than the pilot; else assuredly it will not convey the noble author to the pinnacle of scientific fame.

Count Vargas visited the islands under some advantages for the prosecution of his proposed researches, the Portuguese government, at the instance of that of Denmark, having forwarded instructions to the local authorities to afford him every facility and attention. He arrived at Madeira, and after remaining there some months, proceeded to the Azores. These he visited in succession, and then returned to Lisbon, where he gave to the public the results of his observations, in the Portuguese language, in the work now under our notice.

It appears to have been one of the objects of the Count's expedition, to settle the question as to the former existence of a continent or large island between Europe and America. The submersion of a western continent or island under the waters of the ocean, according to the account given to Solon by the Egyptian priests, was a retribution for the moral depravity of the inhabitants. The larger work in progress will no doubt more fully enlighten us as to the antediluvian bones, — "o grande osso antediluviano," — at Madeira ; and it will not surprise us if the learned author discovers them to be neither more nor less than the fossil remains of some of these unhappy people. The map of that distinguished geologist, Bory de St. Vincent, we presume is to be shown to have been drawn "from actual survey"; and all difficulties attending the hypothesis that any causes in operation now, or at any period since the creation of man, could have submerged beneath the waters a tract of land extending from 40° to 15° north latitude, including the Azores, Cape de Verds, and the Peak of Teneriffe, are to fade like the baseless fabric of a vision. The faith of geologists in such men as Humboldt, Von Buch, Bennet, and others is doomed to be shaken, if not wholly swept away ; and we shall look for a profound dissertation on the existence of the "inscribed stone" of St. Michael's, of "the equestrian statue with its hand pointing to America" of the island of Corvo, and of the "vase full of Carthaginian money" found on the beach at Flores, to say nothing of the hundred and one traditions of Fructuozo and Cordeiro. * We shall be curious to learn whether the monkish legends, with which the Count seems to have been so familiar, deterred him from visiting that most remarkable spot in St. Michael's, the valley of the Furnas ; nor will it surprise us to be informed that he

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* These traditions, we are informed in a note, have been copied into all the modern works on these Islands. "Estas tradições forão publicadas em todos os livros modernos." We will not pretend to say how far this may be correct as regards works in other languages; but not one of the many works and descriptions in French or English, that we have had an opportunity of examining, contains even an allusion to these fables. We do not include the miserable fiction of the imaginative Ashe, whose veracious travels in the United States were surpassed in originality by his quarto on the Western Islands. If this should have happened to be the only work in English, that fell into the Count's hands, we can account for the positive assertion to which we have alluded.

did not venture within a couple of leagues of the hot springs of this beautiful valley, where he may have settled it in his mind that the ancient inhabitants of Atlantis are still expiating their crimes in the boiling mud and sulphur of the Caldeiras.*

These are not the only remarkable objects, of which the Count has taken only the most hasty notice. Thus he merely mentions the occurrence of caves in some one of the islands, but has omitted to notice the very extensive caverns in the lava of Fayal and St. Michael's, some of which, particularly in the latter island, were explored and are minutely described by Dr. Webster in his work on the Azores, published in 1822, and which exhibited not only many singular forms of stalactical lava, but afforded other valuable geological information. †

The manner in which the occurrence of opal at Fayal is mentioned (page 12), might lead to the supposition that it was discovered by our author, though we happen to know that it was first noticed and made public by that indefatigable naturalist, Mr. Nuttall, several years since. It has been usual for geological observers of any reputation, who have described tracts of country which had been previously examined by others, carefully to acknowledge the sources of information they had occasion to use. But this does not appear to have been deemed necessary by Count Vargas. He briefly tells us, in the compass of four lines, that some of the islands have been glanced at by his Excellency M. d'Albuquerque, and some "naturalistas Inglezes." With the exception of the late Mr. Bowdich, no English "naturalista" has been deemed worthy of mention. The notice of Mr. Bowdich,* as well as the allusion to Albuquerque's † very imperfect account in the Portuguese language, could not very well have been avoided, our author having been greatly indebted to the first named traveller, and the "Resumo" having been published in Lisbon. We cannot for a moment suppose, that a "Director do Museo Real da Historia Natural," had never seen Von Buch's work, or stumbled on Humboldt's first volume; and though other works of humbler pretensions may well have escaped his notice, certain it is that the "Resumo" everywhere exhibits marks of having been, for the most part, sublimed, like the sulphur of the islands, from some hidden store-house of materials; — that is, so far as its statements are correct; there remains enough, after this deduction, to entitle it to the character of great originality.

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* For a description of these springs, inferior only to the Geysers of Iceland, and which are merely named in this "Resumo," we must refer our readers, to Dr. Webster's account in the Edinburgh Philosophical Journal; and for a minute analysis of the waters by Dr. Jackson, to a late number of the American Journal of Science.

† Count Vargas slightly alludes to the works of "alguns Inglezes," which he pronounces to be merely the results of a cursory glance, "correrão de passagem," but he does not appear to have met with that of our countryman Dr. Webster. This was, we believe, the result of a residence of the greater part of a year. It has long been known to geologists, and has been often quoted by Lyell, Daubeny, and other European geological writers. Dr. Webster has recently made a second voyage to the islands, and observed several new and interesting phenomena, among which may be mentioned the discovery of the evolution of large quantities of carbonic acid and nitrogen gases, from the hot springs and fissures in the lava; some remarkable changes on the surface from the action of water; several new fumaroles, in different places, with deposits of silica; springs of hot water beneath the running streams of cold water, and many other interesting facts. The effect of the carbonic acid emitted from a fissure at the base of a hill of trachyte and tuffa in St. Michael's, is described by Dr. Webster as very striking. In front of the fissure was a level field of some acres in extent, planted with Indian corn. The corn, at the distance of ten or fifteen yards from the fissure (a mere crack in the rock) was nearly full grown, and of the usual height; but as it was nearer to the fissure, this regularly diminished, and, within five or six feet, it was but a few inches in height. This curious effect was obviously owing to the gases flowing from the fissure, at first on a level with the plain, where they spread laterally, but in consequence of their great specific gravity, remained on the ground; as the distance however from the fissure increased, they became more and more mingled with atmospheric air, and were more and more elevated, until they rose above the corn, which there attained its proper growth. This affords a fine illustration of Dr. Dalton's theory of the diffusion of gases, and of the influence of carbonic acid on vegetation.

It is well known to geologists of the present day, that many errors have been committed by those, who have turned their attention to volcanic districts, in consequence of their having overlooked some of the most decided craters, from their want, probably, of decided symmetry. This appears to have been the case with Count Vargas. He tells us, for instance, that there are but two craters in St. Michael's; we believe he would have come nearer the truth if he had said two hundred. He does not seem to have been acquainted with the true characteristics of a volcanic country, or to have been aware that the existence of a crater is by no means characteristic of a volcanic mountain or island. The operation of time and the influence of external agents, are not the only causes of the great changes which craters undergo. As has been justly remarked by Mr. Scrope, there exists in the volcanic phenomena themselves, a tendency to obliterate their forms ; — a series of causes alternately scooping out the interior of a volcanic mountain, and gradually filling up again the cavity or crater thus produced.* Of the changes which volcanic countries gradually undergo long after active eruptions, we have very recent evidence in regard to the vicinity of Jorullo in Mexico, where, in 1759, a tract of ground from three to four square miles in extent rose up in the shape of a bladder, with thousands of small cones, from six to ten feet in height ; and in the midst of these, six large masses sprung up from a chasm, from three hundred to sixteen hundred feet each, above the old level of the plains. Since this spot was visited and described by Humboldt, about twenty-four years have elapsed, and during that time the immediate vicinity has undergone such a change, that it can hardly be recognised from his description, and a great part of the little cones have disappeared.† "When," says Professor Daubeny of Oxford, — whose philosophical work on volcanoes is well known to geologists, and whose recent visit to the United States has afforded so much pleasure to so many of our readers, — "when we observe a mountain constituted of materials, possessing even in part, a vitreous aspect and fracture, together with a cellular structure, &c. we need not hesitate in pronouncing the whole mass as volcanic, although all vestiges of a crater may be lost, and the form possess no analogy to that which belongs in general to mountains of the same class."‡ We need not multiply authorities on this point, and will only add, that because the Count saw none of his expected vestiges of craters in several of the islands, it is no proof that they do not exist. His only notion of a crater was probably that of all persons who have not made themselves acquainted with the true geological import of the term.

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* Bowdich's posthumous work on Madeira and Porto Santo was published in 1825.

† Observações sobre a Ilha de S. Miguel, Lisboa, 1826.

Count Vargas has made one notable discovery, of the honor of which we would on no account deprive him. It is that of "schisto argiloso primitivo" in the Island of Graciosa, a specimen of which we happen to have seen, marked, if not by his own hand, by his authority. It is as distinct trachyte with crystals of felspar and vesicular cavities, as was ever found in a volcanic region. The slaty structure and somewhat vitreous lustre are the only characters which give it any resemblance to argillaceous schist.

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* Considerations on Volcanoes, London, 1825.

† See Burckhardt's Travels in Mexico.

‡ A Description of Active and Extinct Volcanoes, London, 1826.

In the description of the island of St. Mary's, we are told, that it had been supposed to be primitive, or to contain primitive rocks. Where this piece of information was picked up, we are unable to say. We have seen portions of granite' which were ejected from the extinct volcanoes of one of the Azores but little changed, yet still exhibiting proofs of having been subjected to a very high temperature; but we never before heard of the occurrence of primitive rocks in St. Mary's. This island, but a few miles from St. Michael's, and in plain sight, is conceived by the Danish geologist to be a fragment of Madeira, at least a thousand miles distant. The reasons for this belief will we fear not be quite so satisfactory to others. They are, the similarity of stratification of what he terms the basalt, the presence of the same species of conglomerate and tuffa, the same "calcareous element," in superficial layers, &c. So too the remains of forests on the opposite sides of Porto Santo and Madeira, the occurrence of the same rocks, the symmetry of the basaltic layers, and the presence of basaltic veins in both, are adduced by Count Vargas as proofs of the original connexion of those two islands. The same reasoning, carried a little way further, might have been made to prove the original connexion of St. Mary's with Iceland and Desolation Island, with all the intervening dry land, with the Moluccas, and the Giant's Causeway. It is true, as stated by Count Vargas, that limestone occurs in the island of St. Mary's, but it is of most obvious recent formation. It is quite hard indeed, but full of fossil marine shells, and impressions, with many fragments of lava, tuff, and obsidian, and perfect crystals of augite. If this limestone had been of anterior formation to the lava, it must have been subjected to enormous pressure, otherwise its carbonic acid must have been driven off. The absence of such pressure is not only indicated by the limestone itself, but also by the cellular appearance of the fragments of lava enclosed in it.

As regards the clays met with in several of the islands, so far from having been originally deposited in their present state, they have originated from the action of the acid vapors and gases upon the felspathic rocks, the trachytes and porphyries in their vicinity; and it is a process which is to be seen going on at this very moment, not only here, but in all solfaterras. When the escape of these gases and vapors shall have ceased, the vast quantities of argillaceous matter, now soft and nearly liquid, will probably become dry and hard, and put on the same appearance as the clays of St. Mary's.

We have remarked, that while the views of geologists as to the changes to which these islands may have been subjected, will of course differ, as to their volcanic origin there can be but one opinion. The questions, for instance, whether their lavas have been all ejected under or above the waters, and whether certain parts have been elevated and others depressed, will admit of discussion. But we shall leave these points, and endeavour to present our readers with some of the results of the observations of geologists, who have preceded the author of the "Resumo."

Madeira was several years ago described by Von Buch, as consisting of beds which have been elevated above the level of the ocean by elastic fluids; but he did not notice any distinct craters. Mr. Bennet found two craters, one on the eastern, and the other on the western side of the island,* the largest being about four English miles in circumference. Mr. Scrope, in his ingenious and valuable work on volcanoes, quotes Madeira as one of the many examples of islands composed chiefly of volcanic products, which have risen from below the sea, solely by subterranean expansion, without having been since augmented in height or bulk by the products of external ejections.† Mr. Bowdich's account leaves no doubt of the volcanic origin of Madeira, and he has described the tuff, scoriæ, pumice, and other volcanic products of which it consists. He found the tuff and scoriæ repeatedly alternating with a cellular basalt (lava ?), forming a bed or current, the direction of which was indicated by that of the oval or elongated cells. He also describes a compact and columnar variety of basalt, in many places covering the other strata, and itself here and there covered by fragments cemented by a yellow tuffa. In the centre of the island this was seen immediately incumbent on limestone, which Mr. Bowdich considers as the fundamental rock, and the thickness of which is seven hundred feet. This limestone he refers to the transition series. Both this and all the other rocks are traversed by very numerous dykes of basalt. An elliptical funnel-shaped depression was observed about eighty feet above the sea, which was probably a crater of elevation. From Mr. Bowdich's account, it presents every appearance of having been formed by a minor volcanic heave, which threw up vast blocks of the rock it rent from beneath the ocean, but did not eject any lava or contents of its own.

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* Geological Transactions, London, Vol. I. p. 392.

† Scrope on Volcanoes, London, 1825, p. 183.

The island of Porto Santo appeared to the same observer to consist of tertiary sandstone and limestone, alternating with the volcanic strata. The lowest visible deposit is a calcareous tuffa, reaching to the height of sixteen hundred feet, and traversed by vertical dykes of basalt. The sandstone Mr. Bowdich considered as of more recent origin than the volcanic deposit; and in the neighbouring island of Basco he saw the calcareous tuffa covered with beds of limestone a hundred feet above the level of the sea. Count Vargas professes his belief that the calcareous rock and basalt are contemporaneous. But the limestone abounds in shells, which, together with the relative position of the two rocks and other geological appearances, lead to the probable inference of the limestone being of more recent origin. The horizontality of the strata, both in this and some of the other islands, is opposed to the theory of elevation by violent volcanic action beneath a limited area ; but the facts which have within a few years been brought to light, have relieved us from the necessity of resorting to this explanation. Our views in regard to volcanic action have been greatly modified, and we have been taught, that a gradual rise of land over a great extent of country has been and is going on. We think that evidence exists of such change in some of these islands, and little or none of that subsidence and submersion of which the Count was apparently so well satisfied.

The curious and highly interesting circumstances in regard to the elevation of the solid strata of the North of Europe, and in South America, are now familiar to geologists, but may be less so to some of our readers, and certainly do not appear to have been known to our author. There is now no doubt of the rise of land on the coast of Chili in 1822, and again in 1835 to the height of ten feet in some places. Indeed Mr. Darwin observed evidence of a rise of fourteen feet about sixty miles south of Valparaiso, in the shells attached to the rock. Similar facts have further shown that the whole coast of the Pacific from Peru to Terra del Fuego has undergone this change of level. The parallel terraces, as at Coquimbo, which rise to the height of three hundred feet and more, have been found to be covered with seashells, indicating successive elevations. And this has not been effected by sudden and violent action only, but also by insensible degrees, as is now admitted to be the case in parts of Norway and Sweden, and in the island of Great Britain. The elevation of the coast of South America, which we believe first attracted notice, was attended with a terrific earthquake, but in the North of Europe along the coasts of the Bothnian Gulf the rise has been gradual, and unattended with any volcanic phenomena. Mr. Lyell has recently examined the marks, cut in the rocks by the Swedish pilots under the direction of the Swedish Academy in 1820, and found the level of the Baltic in calm weather several inches below them. He also found the level of the waters several feet below marks made seventy or a hundred years before. He obtained similar results in other places. He discovered deposits on the side of the Bothnian Gulf, between Stockholm and Gefle, containing fossil shells of the same species which now characterize the brackish waters of that sea. These occur at various elevations, of from one foot to a hundred feet, and sometimes reach fifty miles inland. The result of this examination induced Mr. Lyell to declare his belief, that certain parts of Sweden are undergoing a gradual rise to the amount of two or three feet in a century.*

The relative changes of level of the sea and dry land have been noticed in several other places, especially in the neighbourhood of Pozzuoli, of which M. Arago gave an account at the meeting of the Academy of Sciences on the 15th of May, 1837, together with the results of the observations of M. Capocci, Director of the Observatory at Naples. It is to be hoped, that this highly interesting phenomenon, connected with the physical history of the earth, will not be neglected by observers in this country, which has already presented so many new and important geological facts. Mr. Babbage has proposed an ingenious explanation of these phenomena, viz.

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* Fourth Report of the British Association for the Advancement of Science.

the local changes of temperature in the lower strata of the earth; and has calculated that a change of 100° Fahrenheit that should affect a formation of sandstone to a depth of five miles, would cause an elevation at the surface to the extent of twenty-five feet.*

Before undertaking a description of these islands, our author should have made himself somewhat acquainted with the phenomena of subaqueous volcanoes, and would then have been saved the unsuccessful labor of bending facts to a preconceived theory. He must have seen in every island evidence of the repetition of eruptions, and ought to have been aware that such repetitions must have had the effect of raising the summits of the once submarine mountains above the level of the sea. According to the best observers, the limit of elevation has in many cases been attained, and hence we have these and other insular volcanoes. The observations of Humboldt and Von Buch, have led them to the opinion, that in submarine eruptions, the strata previously forming the bottom of the sea are uniformly elevated. Hence it is easy to account for the presence of the limestone in these islands, and the occurrence in it of fossil shells and impressions. But in some, the limestone is of more recent origin.

The great lateral extension of many of the beds of lava in these islands is one of the many evidences of their having flowed under the pressure of the ocean, as has been remarked in Iceland, the Ferroe islands, and others whose submarine origin is admitted by all observers. Where volcanic action has broken out since the elevation, the craters, or lateral openings and dykes, are everywhere seen. In some of the beds of lava, the vessicles or air bubbles are of prodigious size, two or more feet in diameter, and those of smaller size are everywhere met with, even in the hardest and most compact lava, while that in which they are so numerous as to give the lava the spongiform and cellular aspect, occupies the sides of the hills or covers large tracts of surface. The hills and mountains with which the islands abound, marking the sites of eruptions, and the plateaux composed of compact lava and tuff, or covered by pumice and scorified fragments, with blocks of obsidian, still farther indicate a submarine origin, and render the resemblance to Iceland and the islands already referred to still more striking.

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* Edinburgh Philosophical Journal, Oct. 1837.

The interpositions of beds of scoriæ and tuffa, which are to be seen in the most distinct manner alternating with the beds of basaltic lava all along the coasts, in bold precipices, indicate a series of ejections at successive intervals. In some of the islands, high bluffs are composed entirely of very hard, light-colored tuffa, which, as at Fayal, might be mistaken for sandstone; in other places detached masses rise in pinnacles above the waters, or have been cut through by the action of the waves, presenting the most picturesque appearance. Some of them are arched and the waters flow beneath.

Great changes on the surface are going on at this day. Within the recollection of many of the inhabitants, torrents of water have rushed from the mountains, carrying destruction in their course, overwhelming cottages and cultivated spots with huge masses of rocks, pumice, and loose earth. There is one spot in St. Michael's, several acres in extent, which was verdant and cultivated, until on a sudden the whole surface was covered with huge fragments borne down in the course of one night, and it is now a barren waste of loose rocks. In another spot, on the side of a deep ravine, at the bottom of which flowed a small stream, an enormous mass of pumice, an acre or two in extent and several hundred feet in thickness, suddenly separated from the main body, which formed an extensive plain, and fell into the ravine, leaving a yawning and frightful chasm. In Madeira these destructive effects have been more common and terrific than in the Azores. The effect of a most frightful flood, which occurred in 1803, has been described by an eyewitness, when such a swelling of the rivers took place, that they shortly rose and overflowed their banks, rushing down the declivities, and sweeping away whole vineyards and plantations, cattle, wine, stores, and the houses of the inhabitants, who, with their whole families perished. Rocks of enormous size, as well as the largest trees, torn up by the roots, were carried from the mountains to the sea. The vestiges of this dreadful flood are still to be seen. A crater, said to be about three quarters of a mile in circumference, had a segment of its larger circumference, with the trees growing upon it, borne down into the bottom of the crater. In the town of Funchal, whole lines of houses with their inmates were swept into the sea, churches, bridges, and edifices of every description were involved in the same general wreck. It was computed that no less than three hundred persons perished.

The action of the waves is continually producing changes along all the coasts, the interposed beds of tuff and cinders are washed away, and the compact beds of lava being left unsupported, fall. The shores are strewed with huge blocks and fragments of all sizes.

Did not the geological structure of the islands furnish abundant evidence of volcanic action, we find it on record in the islands, and in one of the earliest works, that eruptions and earthquakes have occurred at various times, as well within the recollection of living witnesses as at earlier periods.

The first earthquake of which we have been able to find any record was on the 25th of October, in the year 1522, when five thousand persons were destroyed. It occurred at daylight, and was particularly violent in the district of Fanaes da Ajuda and Maia, on the north coast of St. Michael's. It extended to a considerable distance, nearly destroying the large city and port of Villa Franca. A large part of the town was laid in ruins, and the Franciscan convent and other buildings were overwhelmed by a torrent of ashes and mud which has since become consolidated into a compact tuffa. Although the destruction of this place is now always attributed, by the present inhabitants, to an earthquake, it is beyond doubt that an eruption took place, of which we find traces in the compact lava covering the tuff and running out into the sea, forming indeed a wall with points here and there appearing above water, and resembling somewhat a coral reef, in front of the town. There is also in front of the town an island of tuff in distinct strata, dipping towards the interior in the form of a washing basin.*

In 1563, on the 25th of June, the whole island of St. Michael's was convulsed with an earthquake, which was most seriously felt in the neighbourhood of Ribeira Grande. An eruption appears to have taken place near the centre of the island; and the hill formed, which has now the name of Mount Vultur, exhibits abundant evidence of this event. The lava flowed in a current chiefly to the West, and covered Cabuco with porous lava; a tract which still remains uncultivated. At this time a large crater, called Lagōa do Fogo (or Lake of fire), twelve and a half fathoms deep, was formed.

An eruption also occurred on the 2d of September, 1630, in the valley of the Furnas, and the spot is now a nearly circular plain surrounding a somewhat high hill with a crater at top. At this time the cinders were carried nearly ninety leagues, as far as Terceira.

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* See a plate and description of this island in Daubeny on Volcanoes, copied from Dr. Webster's work.

Since then other eruptions of minor importance have taken place from the same spot. On the 10th of October, 1652, the elevated Pico do Fogo was raised, and on the 19th of the same month, the hill called Pico de Jão Ramos, northeast of Lugar de Rosto de Cão in St. Michael's. July 3d, 1638, was an eruption from the sea off Pico das Camarhinas, at the distance of one league from land, and where there were forty fathoms of water. In 1691, there was an eruption off St. Michael's, and another in 1720, producing an island six miles in circumference. Many earthquakes occurred in the autumn of 1810. On the 1st of February, 1811, was an eruption off Genetes ; and on June 13th occurred another, about a mile from the island of St. Michael's, which elevated the island called Sabrina, described and depicted in Dr. Webster's work. The same phenomena have since occasionally recurred, but there has been no actual volcanic eruption in St. Michael's. In the island of St. George a destructive eruption happened in 1808, which is also described by Dr. Webster.

In the Count's meagre notices of the other islands, there is nothing which demands notice. We should perhaps make an exception in regard to Flores, where he professes to have discovered a vein of zinc ! — more primitive rocks, — the "schisto argilloso primitivo" again ; — and "grandes depositos de barro proprio para cachimbos," which may be translated pipe clay, enough for all the smokers, of whom there is no deficiency, in the islands ; — a discovery (this last) so far exceeding in importance any other recorded in the "Resumo," that its author deserves from the grateful Azoreans a perennial monument of pipe-stems.

In a word, all the geological phenomena, which have been remarked, lead to one and the same inference in regard to the volcanic origin and causes of the present aspect of the remaining members of this archipelago, and lend no support to the theory of subsidence. We do not hesitate to express our opinion, that not only Madeira and the Azores, but also the Cape de Verds and Canaries have had a similar origin, and are to be viewed as belonging to the third class in Mr. Scrope's arrangement of volcanoes ; in which are also comprised many of the volcanoes in the Cordilleras of South America, those of Sumatra, Java, the Moluccas, and nearly all in the islands of the Pacific, — in all of which we hear of terrific eruptions occasionally breaking out from mountains which were not previously suspected to be of volcanic nature, or from the adjacent waters.

ART. IV. — *Histoire de Napoléon*, par M. DE NORVINS. Deuxième Édition en quatre Tomes, à Paris et à New York. 1829.

History of Napoleon, by M. DE NORVINS.

THOUGH scarcely known in this country, the History of M. de Norvins is generally esteemed in Europe the most valuable work hitherto published on Napoleon and his age. It has been rendered into several of the continental languages, and should before now have been placed, in a good translation, in the hands of English and American readers.

We refer to it, however, at the present time, for a different purpose from that either of analysis or criticism. We propose to throw together some notices of a personage, who, for a brief space, occupied a prominent position in that eventful history; — one of those many actors on a busy scene, whom time silently sweeps away, and whom the world so easily forgets, as soon as they have ceased to be the immediate objects of hope or fear, of admiration or animosity.

In a newspaper of last autumn, among the scraps of foreign intelligence, our eye fell upon a hasty announcement of the death of Maria Louisa, Archduchess of Parma, widow of Napoleon Bonaparte; one, who, had she been so happy as to have died twenty-seven years ago, in giving birth to the heir of that splendid royalty which then she shared, would have had her praises proclaimed from the pulpits of all Christendom, and her last words registered in the annals of nations. But she outlived her fair destinies. Clouds settled round the sunset of her day; and she went down in silence and loneliness, unheeded and unlamented, lost in the crowd of monarchs, an outcast from renown.

In giving a short biographical sketch of this princess, it